

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-040509

(43)Date of publication of application : 12.02.1999

(51)Int.Cl.

H01L 21/22

H01L 21/31

H01L 21/68

(21)Application number : 09-211375

(71)Applicant : KOKUSAI ELECTRIC CO LTD

(22)Date of filing : 22.07.1997

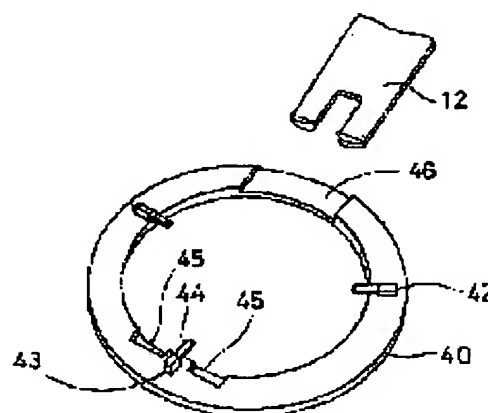
(72)Inventor : MARUBAYASHI TETSUYA

(54) BOAT OF SEMICONDUCTOR MANUFACTURING EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To increase the number of wafers processed at a time to improved the throughput, by providing a claw on which a wafer is placed on the upper surface of holder plates bonded, in multiple stages, in horizontal attitude to a plurality of pillars, while providing a recessed part where a tweezer for wafer shift/place is allowed for free engagement.

SOLUTION: A boat comprises such configuration where a plurality of pillars are elected spanning a bottom plate and a top plate, while annular quartz holder plates 40 are welded, in multiple stages, in horizontal attitude to the pillar. On the upper surface of the holder plate 40, one claw 42 is bonded on a center line of the holder plate 40, on the side opposite to wafer taking in/out side, while two claws at laterally symmetric positions about the center line, respectively, three in all. On both sides of the claw 42 on the center line on the upper surface of the holder plate 40, first recessed parts 45 a are formed, respectively, while a second recessed part 46 formed on wafer taking in/out side on the upper surface of the holder plate 40. A tweezer 12 is allowed free engagement with the first recessed parts 45 and the second recessed part 46.



LEGAL STATUS

[Date of request for examination]

16.07.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

*** NOTICES ***

**JPO and NCIPi are not responsible for any
damages caused by the use of this translation.**

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The boat of the semiconductor fabrication machines and equipment characterized by preparing the crevice into which TSUIZA for a wafer transfer can fit loosely while fixing the holder plate by the horizontal position to two or more stanchions multistage and protruding the pawl for wafer mounting on this holder plate top face.

[Translation done.]

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the boat of the semiconductor fabrication machines and equipment holding a wafer in a semi-conductor production process.

[0002]

[Description of the Prior Art] Semiconductor fabrication machines and equipment generate various thin films to processed substrates, such as a wafer or a glass substrate, or perform etching etc., and form many semiconductor devices in a processed substrate front face.

[0003] In these semiconductor fabrication machines and equipment, especially the semiconductor fabrication machines and equipment which have a vertical mold furnace, when mainly generating the HTO (High Temperature Oxidation) film to a wafer, a wafer is held by the horizontal position multistage at a boat with a holder for the improvement in homogeneity of the film generated by the wafer.

[0004] The outline of semiconductor fabrication machines and equipment of having a vertical mold furnace in drawing 4 and drawing 5 is explained.

[0005] The cassette loader with which one in drawing is a case and 2 is located in a before [the case 1 interior of this] side, The cassette shelf with which 3 was prepared in the backside [this cassette loader 2], the buffer cassette shelf with which 4 was prepared above this cassette shelf 3, The wafer transfer machine with which 5 was prepared in the backside [said cassette shelf 3], the boat elevator which 6 is prepared [boat elevator] in the backside [this wafer transfer machine 5], and makes it go up and down a boat 7, and 8 show the vertical mold furnace formed above said boat elevator 6.

[0006] said wafer transfer machine 5 -- ** which can be gone up and down -- Sai chief plate-like TSUIZA 12 which it has the pivotable attitude device section 9, and the chucking head 10 is formed in this attitude device section 9 horizontally possible [an attitude], and mounts a wafer 11 on this chucking head 10 -- eclipse ***** with a necessary plan.

[0007] Next, drawing 5 explains the conventional boat 7 in relation with the vertical mold furnace 8.

[0008] A heater owner heavens tubed in 13 in drawing, the outer tube with which the upper limit by which 14 was arranged in this alignment by this heater 13 was blockaded, and 15 are the inner tubes with which the upper part established in the interior of this outer tube 14 at this alignment was opened wide, and this inner tube 15 is set up on the throat flange 16 prepared in the lower limit of said outer tube 14. A reaction chamber 17 is formed with said inner tube 15, and the cylinder-like space 18 where the lower limit was blockaded is formed between said outer tubes 14 and said inner tubes 15. The exhaust pipe 19 was opened for free passage by the lower limit of this space 18, and the reactant gas installation tubing 20 inserted in from said throat flange 16 has started to near the upper limit of the boat cap 21 later mentioned in accordance with said inner tube 15 wall.

[0009] It is set up by the throat lid 22 through said boat cap 21, said boat 7 is loaded with the wafer of the predetermined number containing 75 wafers for products by the horizontal position, and said boat 7 blockades the lower limit of said throat flange 16 airtightly with said throat lid 22.

[0010] Conveyance of said wafer 11 is performed where the wafer cassette 23 is loaded, and after this wafer cassette 23 is conveyed by the external transport device which is not illustrated, it is contained by the necessary location of said cassette shelf 3 and the buffer cassette shelf 4 with said cassette loader 2. Said wafer transfer machine 5 transfers said wafer 11 between said wafer cassette 23 contained by said cassette shelf 3 and said boat 7 in a downward condition so that it may mention later.

[0011] Said boat 7 loaded with said wafer 11 is inserted in by said boat elevator 6 in said reaction chamber 17 heated to necessary temperature at said heater 13, the inside of this reaction chamber 17 is ***** (ed),

reactant gas is introduced from said reactant gas installation tubing 20, membrane formation processing is performed to said wafer 11, and exhaust gas is exhausted from said exhaust pipe 19.

[0012] If the membrane formation to said wafer 11 is completed, installation of reactant gas is suspended, inert gas will be introduced, a gas purge will be carried out, and said boat 7 will be pulled out from said vertical mold furnace 8 after that.

[0013] The transfer to said wafer cassette 23 of said cassette shelf 3 from this boat 7 is performed by the thing to said boat 7 which mentioned above said wafer 11 after processing for which the reverse of the procedure of a transfer is performed, and this wafer cassette 23 is taken out further outside.

[0014] Next, said conventional boat 7 is explained in drawing 6 - drawing 10.

[0015] Said boat 7 is set up by said throat lid 22 which opens and closes the lower limit of said vertical mold furnace 8 through said boat cap 21, and this throat lid 22 is supported by the boat elevator 6 mentioned above, and can go up and down it.

[0016] Said boat cap 21 forms cylinder-like space, the adiathermic holder which is not illustrated is formed in the interior of this boat cap 21, and the heat insulation plate (not shown) of necessary number of sheets is held horizontally at this adiathermic holder.

[0017] Said boat 7 has the configuration by which four stanchions 26 were set up by two or more and drawing 6 as **** between a bottom plate 24 and a top plate 25, and this stanchion 26 is arranged in the range of an abbreviation semicircle periphery so that receipts and payments of said wafer 11 may be possible. The circular ring-like holder plate 27 made from a quartz was welded to said stanchion 26 by the horizontal position multistage, and a total of three pawls 29 per piece have fixed to one piece and said center line 28 on the top face of this holder plate 27 at the bilateral symmetry location to the opposite side by the side of receipts and payments of said wafer 11 on the center line 28 of this holder plate 27.

[0018] This pawl 29 consisted of the stanchion section 30 and an inner brim 31, and this inner brim 31 has fixed it so that the tip of said inner brim 31 may point out the direction of a core of said holder plate 27 to a location lower one step than the upper limit of this stanchion section 30 on the side face of said stanchion section 30.

[0019] With reference to drawing 11, a transfer of said wafer 11 between said boats 7 and said cassette shelves 3 is explained.

[0020] Said chucking head 10 is retreated, this attitude device section 9 is rotated as a condition that said TSUIZA 12 does not project from said attitude device section 9, and said chucking head 10 is confronted with said wafer cassette 23 of said cassette shelf 3. Said chucking head 10 is advanced, in two or more steps and drawing 11, said five steps of TSUIZA 12 is inserted into said wafer cassette 23, said attitude device section 9 is raised a little in a transfer machine elevator (not shown), and said wafer 11 is laid on said each TSUIZA 12. This attitude device section 9 is rotated as a condition that retreat said chucking head 10 and said TSUIZA 12 does not project from said attitude device section 9 where said wafer 11 is laid on this TSUIZA 12, and said chucking head 10 is confronted with the necessary location of said boat 7. Said chucking head 10 is advanced, said each TSUIZA 12 is inserted into said boat 7, said attitude device section 9 is dropped a little in said transfer machine elevator (not shown), and said wafer 11 is laid on said inner brim 31 of said pawl 29.

[0021] Said wafer 11 is laid on said inner brim 31 of said pawl 29 of a number of said holder plates 27 which repeated said actuation and were planned. Moreover, the procedure in which said procedure is reverse performs the transfer on said cassette shelf 3 from said boat 7 after the completion of processing.

[0022]

[Problem(s) to be Solved by the Invention] There is a request of increasing the number of sheets of the wafer processed at once in order to raise productivity, and in order to correspond to this request, it is necessary to increase the number of sheets of the wafer with which a boat is loaded. However, there is clearance by the building, a clean room, etc. in the tooth space in which semiconductor fabrication machines and equipment are installed, and for increasing the number of sheets of the wafer with which a boat is loaded, the pitch between holder plates must be narrowed.

[0023] By the above-mentioned conventional boat, when TSUIZA was inserted in a boat and bending of a required gap and TSUIZA etc. was taken into consideration, there was a limitation in narrowing the gap between holder plates, the number of sheets of the wafer which can be held on a boat could not be increased, but there was a problem that improvement in a throughput and reduction-ization of a production cost could not be attained.

[0024] This invention tends to increase the number of sheets of the wafer processed at once in view of this actual condition, and tends to aim at improvement in a throughput.

[0025]

[Means for Solving the Problem] A holder plate is fixed by the horizontal position to two or more stanchions multistage, while protruding the pawl for wafer mounting on this holder plate top face, the boat of the semiconductor fabrication machines and equipment which prepared the crevice into which TSUIZA for a wafer transfer can fit loosely is started, TSUIZA advances into a crevice location, and this invention secures the space of vertical migration of TSUIZA by the crevice.

[0026]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing. In addition, among drawing 1 - drawing 3, a same sign is given to a thing equivalent to drawing 6 - drawing 10 R> 0, and explanation is omitted.

[0027] A boat 36 has the configuration by which two or more stanchions 39 were set up as **** between the bottom plate 37 and the top plate 38, and this stanchion 39 is arranged in the range of an abbreviation semicircle periphery so that receipts and payments of a wafer may be possible. The holder plate 40 made from a quartz on a circular ring was welded to this stanchion 39 by the horizontal position multistage, and every one-piece a total of three pawls 42 have fixed to one piece and said center line 41 on the top face of this holder plate 40 at the bilateral symmetry location to the opposite side by the side of receipts and payments of the wafer on the center line 41 of this holder plate 40. This pawl 42 consisted of the stanchion section 43 and an inner brim 44, and this inner brim 44 has fixed it so that the tip of said inner brim 44 may point out the direction of a core of said holder plate 40 to a location lower one step than the upper limit of this stanchion section 43 on the side face of said stanchion section 43.

[0028] the 1st crevice 45 forms in the both sides of said pawl 42 on said center line 41 on the top face of said holder plate 40, respectively -- having -- this every -- the 1st crevice 45 -- the width of face for a point of the **** configuration of TSUIZA 12 -- large -- ** -- it is narrower than the circular ring width of face of said holder plate 40. moreover, the 2nd crevice 46 forms in a wafer receipts-and-payments-side on the top face of said holder plate 40 -- having -- this 2nd crevice -- the width of face of the end face part of said TSUIZA 12 -- large -- ** -- it is prepared over the whole circular ring width of face of said holder plate 40, and said TSUIZA 12 can fit loosely into said 1st crevice 45 and the 2nd crevice 46.

[0029] Actuation is explained below.

[0030] A wafer 11 is mounted on said TSUIZA 12 from the wafer cassette 23 of the cassette shelf 3, and said TSUIZA 12 is confronted with the necessary location of a boat 7. Advance the chucking head 10, insert said TSUIZA 12 into said boat 7, drop the attitude device section 9 a little in a transfer machine elevator (not shown), lay said wafer 11 on said pawl 42, said TSUIZA 12 is made to advance into said 1st crevice 45 and 2nd crevice 46 location, and said TSUIZA 12 is pulled out from said boat 7. Although only the part of said 1st crevice 45 and the 2nd crevice 46 is made as for allowances to spacing of the vertical direction, the path clearance of said TSUIZA 12 top face when pulling out said TSUIZA 12 from said boat 7 and said wafer 11 inferior surface of tongue laid on said pawl 42 and the path clearance of said TSUIZA 12 inferior surface of tongue and said holder plate 40 top face are expanded and said TSUIZA 12 bends, said holder plate 40 is not contacted.

[0031]

[Comparative Example(s)] Drawing 12 - drawing 14 show the relation between the conventional boat and TSUIZA, and assume the pitch between the upper and lower sides of said holder plate 27 to be 8.5mm. Since it is 0.8mm, as it is shown in drawing 12, after the thickness of 1.85mm and said wafer 11 has laid said wafer 11 on said TSUIZA 12, when [both] the thickness of said TSUIZA 12 inserts said TSUIZA 12 in said boat 7, the path clearance of said wafer 11 top face and said holder plate 27 inferior surface of tongue of the right above of this wafer 11 and said wafer 11 inferior surface of tongue, and said inner brim 31 top face is set to 1.1mm, and a transfer activity is possible. However, as shown in drawing 13 R> 3, when pulling out said TSUIZA 12 from said boat 7 Both the path clearance of said TSUIZA 12 top face and said wafer 11 inferior surface of tongue and the path clearance of said TSUIZA 12 inferior surface of tongue and said holder plate 27 top face are set to 0.825mm. As shown in drawing 14, the usual amount of bending of said TSUIZA 12 is 0.35mm, and since path clearance is not enough, considering the actuation error of a machine etc., it becomes impossible for said wafer 11 to transfer work it.

[0032] In the example of this invention, the pitch between the upper and lower sides of the holder plate 40 is set to 8.5mm, and the level difference from said holder plate 40 top face of said 1st crevice 45 and the 2nd crevice 46 is set to 0.5mm.

[0033] Where the wafer 11 with a thickness of 0.8mm is laid on said TSUIZA 12, when said TSUIZA 12 is inserted in said boat 36 Both the path clearance of said wafer 11 top face, said holder plate 40 inferior

surface of tongue of this wafer 11 right above and said wafer 11 inferior surface of tongue, and said inner brim 44 top face is set to 1.1mm like the case of the former shown in drawing 12 . Moreover, when pulling out said TSUIZA 12 from said boat 36 The path clearance of said TSUIZA 12 top face and said wafer 11 inferior surface of tongue, and the path clearance of said TSUIZA 12 inferior surface of tongue and said holder plate 40 top face both Since it can take more greatly every 0.25mm than the case of the former shown by drawing 13 , it is set to 1.075mm and the transfer activity of said wafer 11 is attained.

[0034] Therefore, the effectiveness which was excellent in versatility is demonstrated -- can increase the number of sheets of the wafer for products produced at once from 75 sheets to 100 sheets, and can aim at improvement in a throughput, and reduction-ization of a production cost is attained.

[0035]

[Effect of the Invention] The effectiveness which was excellent in versatility is demonstrated -- contract the pitch between holder plates, according to this invention, as stated above, since the number of sheets of the wafer which can be held on a boat can be increased, can aim at improvement in a throughput, and reduction-ization of a production cost is attained.

[Translation done.]

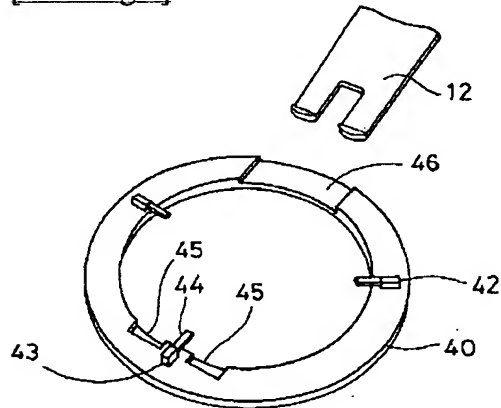
*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

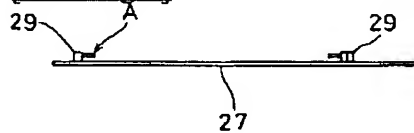
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

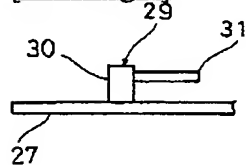
[Drawing 2]



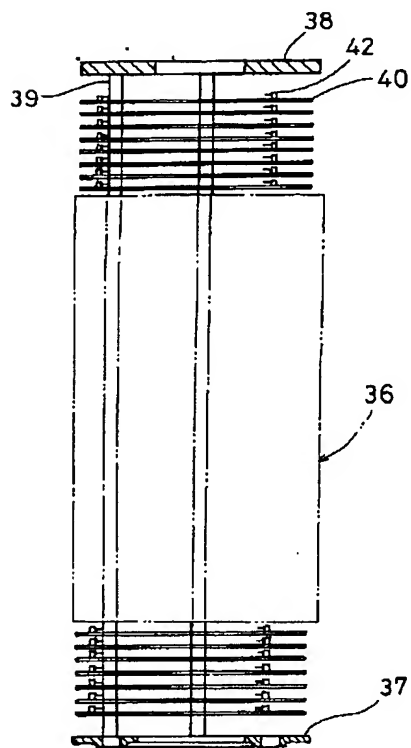
[Drawing 7]



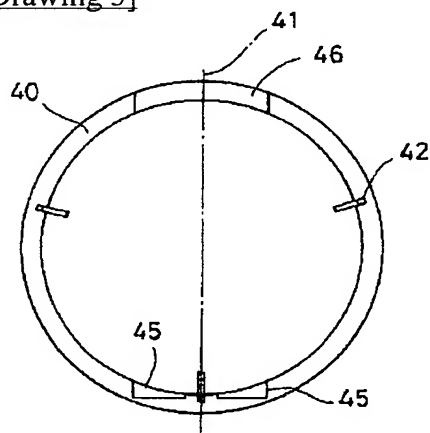
[Drawing 8]



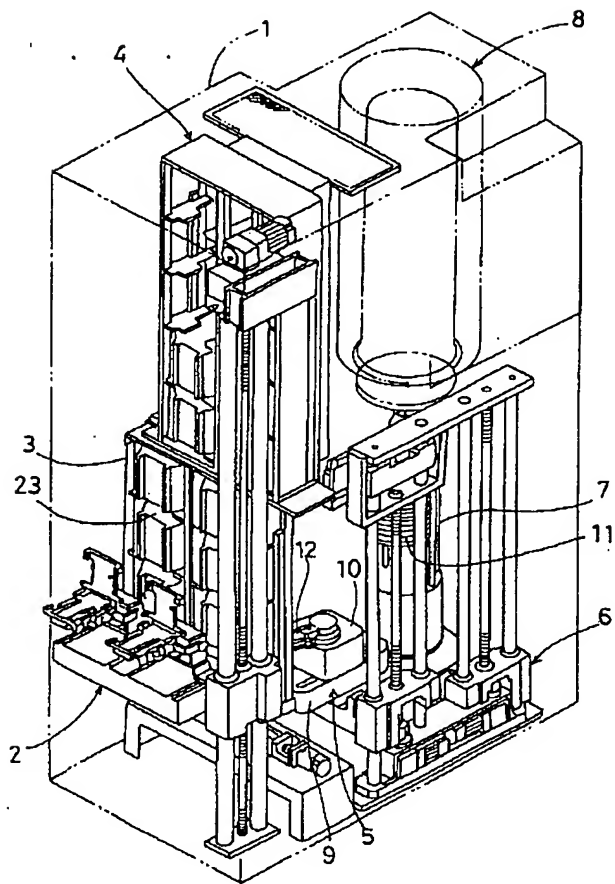
[Drawing 1]



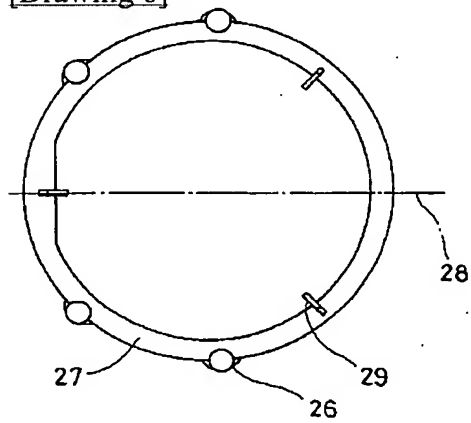
[Drawing 3]



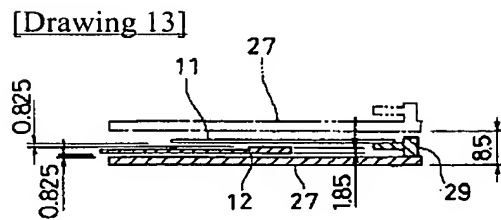
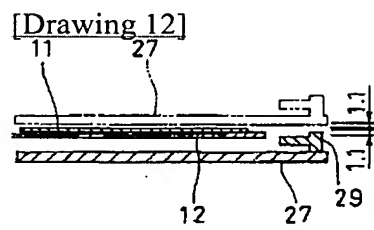
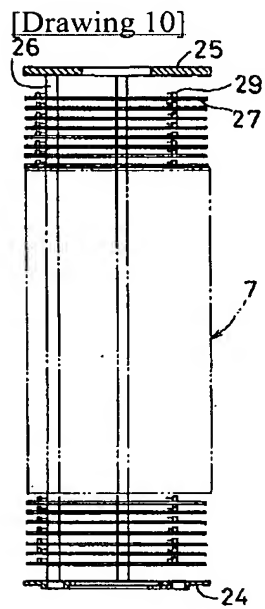
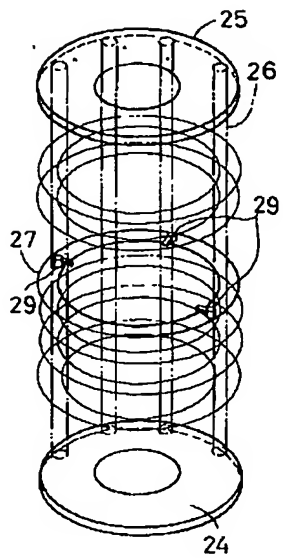
[Drawing 4]



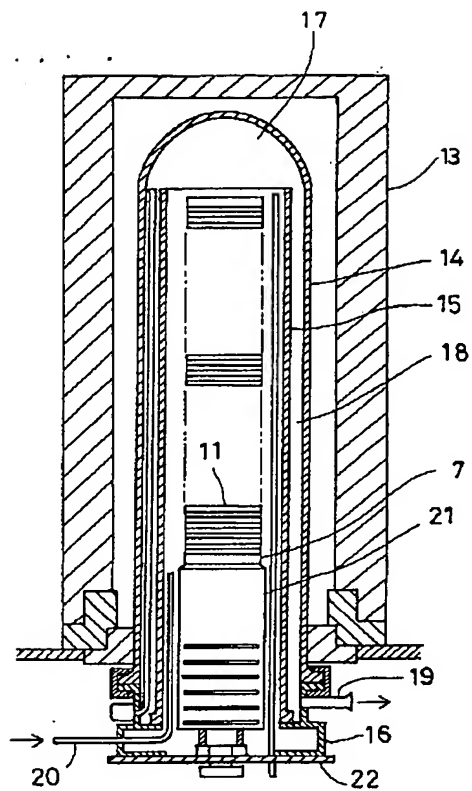
[Drawing 6]



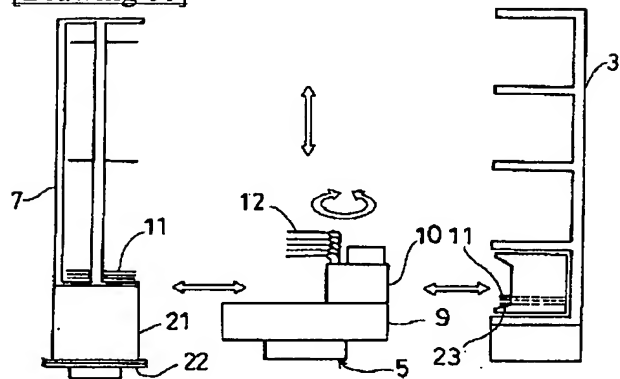
[Drawing 9]



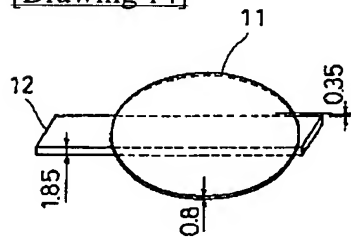
[Drawing 5]



[Drawing 11]



[Drawing 14]



[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
 [Section partition] The 2nd partition of the 7th section
 [Publication date] May 19, Heisei 17 (2005. 5.19)

[Publication No.] JP,11-40509,A
 [Date of Publication] February 12, Heisei 11 (1999. 2.12)
 [Application number] Japanese Patent Application No. 9-211375
 [The 7th edition of International Patent Classification]

H01L 21/22
 H01L 21/31
 H01L 21/68

[FI]

H01L 21/22	511 G
H01L 21/31	F
H01L 21/68	N

[Procedure revision]
 [Filing Date] July 16, Heisei 16 (2004. 7.16)
 [Procedure amendment 1]
 [Document to be Amended] Specification
 [Item(s) to be Amended] The name of invention
 [Method of Amendment] Modification
 [The contents of amendment]
 [Title of the Invention] Semiconductor fabrication machines and equipment
 [Procedure amendment 2]
 [Document to be Amended] Specification
 [Item(s) to be Amended] Claim
 [Method of Amendment] Modification
 [The contents of amendment]
 [Claim(s)]
 [Claim 1]

They are the semiconductor fabrication machines and equipment characterized by holding a processed substrate by the horizontal position on a boat with a holder multistage, and inserting in a vertical mold furnace, and being the semiconductor fabrication machines and equipment which heat-treat said processed substrate, and for said holder having a circular ring-like holder plate, and establishing the crevice into which TSUIZA can advance in the top face of this holder plate.

[Claim 2]

It is the boat with a holder characterized by having been the boat with a holder which holds a processed substrate to multistage by the horizontal position, and for said holder having a circular ring-like holder plate and establishing the crevice into which TSUIZA can advance in the top face of this holder plate.

[Claim 3]

The boat with a holder which is characterized by providing the following and which holds a processed

substrate to multistage by the horizontal position Said holder is a process which has a circular ring-like holder plate, descends so that said TSUIZA which mounted the processed substrate may advance into said crevice to the boat with a holder which established the crevice into which TSUIZA can advance in the top face of this holder plate, and lays said processed substrate in said holder. The process which pulls out said TSUIZA from said crevice The process which inserts said boat with a holder in a vertical mold furnace, and heat-treats said processed substrate The process which pulls out said boat with a holder from said vertical mold furnace

[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-040509

(43)Date of publication of application : 12.02.1999

(51)Int.Cl.

H01L 21/22

H01L 21/31

H01L 21/68

(21)Application number : 09-211375

(71)Applicant : KOKUSAI ELECTRIC CO LTD

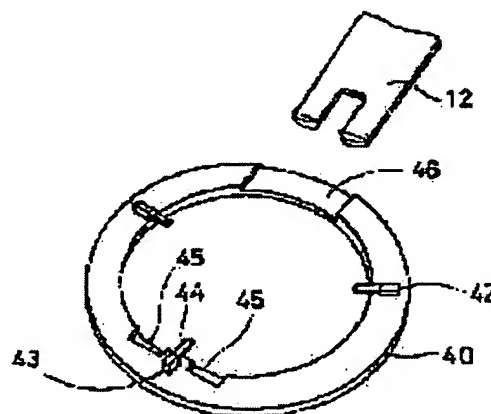
(22)Date of filing : 22.07.1997

(72)Inventor : MARUBAYASHI TETSUYA

(54) BOAT OF SEMICONDUCTOR MANUFACTURING EQUIPMENT**(57)Abstract:**

PROBLEM TO BE SOLVED: To increase the number of wafers processed at a time to improved the throughput, by providing a claw on which a wafer is placed on the upper surface of holder plates bonded, in multiple stages, in horizontal attitude to a plurality of pillars, while providing a recessed part where a tweezer for wafer shift/place is allowed for free engagement.

SOLUTION: A boat comprises such configuration where a plurality of pillars are elected spanning a bottom plate and a top plate, while annular quartz holder plates 40 are welded, in multiple stages, in horizontal attitude to the pillar. On the upper surface of the holder plate 40, one claw 42 is bonded on a center line of the holder plate 40, on the side opposite to wafer taking in/out side, while two claws at laterally symmetric positions about the center line, respectively, three in all. On both sides of the claw 42 on the center line on the upper surface of the holder plate 40, first recessed parts 45 a are formed, respectively, while a second recessed part 46 formed on wafer taking in/out side on the upper surface of the holder plate 40. A tweezer 12 is allowed free engagement with the first recessed parts 45 and the second recessed part 46.

**LEGAL STATUS**

[Date of request for examination] 16.07.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

(19) 日本国特許庁 (J P)

(12) 公 開 特 許 公 報 (A)

(11) 特許出願公開番号

特開平11-40509

(43) 公開日 平成11年(1999) 2月12日

(51) Int.Cl.⁸

H 0 1 L 21/22
21/31
21/68

識別記号

5 1 1

F I

H 0 1 L 21/22
21/31
21/68

5 1 1 G

F

N

審査請求 未請求 請求項の数1 F D (全 6 頁)

(21) 出願番号

特願平9-211375

(22) 出願日

平成9年(1997) 7月22日

(71) 出願人 000001122

国際電気株式会社

東京都中野区東中野三丁目14番20号

(72) 発明者 丸林 哲也

東京都中野区東中野三丁目14番20号 国際

電気株式会社内

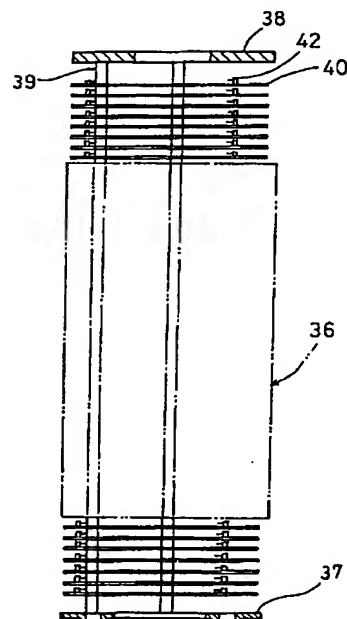
(74) 代理人 弁理士 三好 祥二

(54) 【発明の名称】 半導体製造装置のポート

(57) 【要約】

【課題】半導体製造装置に於いて、1回に生産されるウェーハの枚数を増やし、スループットの向上を図る。

【解決手段】複数の支柱39にホルダプレート40を水平姿勢で多段に固着し、該ホルダプレート40上面にウェーハ受載用の爪42を突設すると共にウェーハ移載用ツィザが遊嵌可能な凹部を設けた半導体製造装置のポートにより、凹部位置にツィザが進入し、凹部によりツィザの上下移動の空間を確保する。



【特許請求の範囲】

【請求項 1】 複数の支柱にホルダプレート水平姿勢で多段に固着し、該ホルダプレート上面にウェーハ受載用の爪を突設すると共にウェーハ移載用ツィザが遊嵌可能な凹部を設けたことを特徴とする半導体製造装置のポート。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は半導体製造工程に於いて、ウェーハを保持する半導体製造装置のポートに関するものである。

【0002】

【従来の技術】 半導体製造装置はウェーハ或はガラス基板等の被処理基板に種々の薄膜を生成し或はエッチング等を行い被処理基板表面に多数の半導体素子を形成するものである。

【0003】 斯かる半導体製造装置、特に縦型炉を有する半導体製造装置に於いて、ウェーハに主に HTO (High Temperature Oxidation) 膜を生成する場合、ウェーハに生成される膜の均一性の向上の為、ウェーハはホルダ付きポートに水平姿勢で多段に保持される。

【0004】 図 4、図 5 に於いて縦型炉を有する半導体製造装置の概略を説明する。

【0005】 図中 1 は筐体であり、2 は該筐体 1 内部の前側に位置するカセットローダ、3 は該カセットローダ 2 の後側に設けられたカセット棚、4 は該カセット棚 3 の上方に設けられたバッファカセット棚、5 は前記カセット棚 3 の後側に設けられたウェーハ移載機、6 は該ウェーハ移載機 5 の後側に設けられポート 7 を昇降させるポートエレベータ、8 は前記ポートエレベータ 6 の上方に設けられた縦型炉を示す。

【0006】 前記ウェーハ移載機 5 は昇降可能且回転可能な進退機構部 9 を有し、該進退機構部 9 には水平方向に進退可能にチャッキングヘッド 10 が設けられ、該チャッキングヘッド 10 にはウェーハ 11 を受載する細長平板状のツィザ 12 が所要段取付けられている。

【0007】 次に図 5 により、従来のポート 7 を縦型炉 8 との関連に於いて説明する。

【0008】 図中 13 は有天筒状のヒータ、14 は該ヒータ 13 に同心に配設された上端が閉塞されたアウトチューブ、15 は該アウトチューブ 14 の内部に同心に設けられた上部が開放されたインナチューブであり、該インナチューブ 15 は前記アウトチューブ 14 の下端に設けられた炉口フランジ 16 上に立設されている。前記インナチューブ 15 により反応室 17 が画成され、前記アウトチューブ 14 と前記インナチューブ 15 との間には下端が閉塞された円筒状の空間 18 が形成される。該空間 18 の下端には排気管 19 が連通され、前記炉口フランジ 16 より挿通された反応ガス導入管 20 は前記インナチューブ 15 内壁に沿って後述するポートキャップ 2

1 の上端近傍迄立上がっている。

【0009】 前記ポート 7 は前記ポートキャップ 21 を介して炉口蓋 22 に立設され、前記ポート 7 には製品用ウェーハを 75 枚含む所定数のウェーハが水平姿勢で装填され、前記炉口蓋 22 により前記炉口フランジ 16 の下端を気密に閉塞する様になっている。

【0010】 前記ウェーハ 11 の搬送はウェーハカセット 23 に装填された状態で行われ、該ウェーハカセット 23 は図示しない外部搬送装置により搬送された後、前記カセットローダ 2 により前記カセット棚 3、バッファカセット棚 4 の所要位置に収納される。後述する様に、前記ウェーハ移載機 5 は前記カセット棚 3 に収納された前記ウェーハカセット 23 と下降状態にある前記ポート 7 間で前記ウェーハ 11 の移載をする。

【0011】 前記ヒータ 13 により所要温度迄加熱された前記反応室 17 内に前記ウェーハ 11 が装填された前記ポート 7 が前記ポートエレベータ 6 により装入され、該反応室 17 内が真空引され、前記反応ガス導入管 20 より反応ガスが導入されて前記ウェーハ 11 に成膜処理が行われ、排気ガスは前記排気管 19 より排気される。

【0012】 前記ウェーハ 11 への成膜が完了すると、反応ガスの導入を停止し不活性ガスを導入してガスパージし、その後、前記ポート 7 を前記縦型炉 8 より引出す。

【0013】 処理後の前記ウェーハ 11 は前述した前記ポート 7 への移載の手順の逆を行うことで該ポート 7 から前記カセット棚 3 の前記ウェーハカセット 23 への移載が行われ、更に該ウェーハカセット 23 は外部に搬出される。

【0014】 次に図 6～図 10 に於いて、従来の前記ポート 7 について説明する。

【0015】 前記ポート 7 は前記ポートキャップ 21 を介して前記縦型炉 8 の下端を開閉する前記炉口蓋 22 に立設され、該炉口蓋 22 は前述したポートエレベータ 6 に支持され昇降可能となっている。

【0016】 前記ポートキャップ 21 は円柱状の空間を形成し、該ポートキャップ 21 の内部には図示しない断熱性ホルダが設けられ該断熱性ホルダに所要枚数の断熱板（図示せず）が水平に保持されている。

【0017】 前記ポート 7 は底板 24 と天板 25 間に掛渡って複数本、図 6 では 4 本の支柱 26 が立設された構成を有し、該支柱 26 は前記ウェーハ 11 の出入れが可能な様に略半円周の範囲で配設されている。前記支柱 26 には円環状の石英製ホルダプレート 27 が水平姿勢で多段に溶接され、該ホルダプレート 27 の上面には該ホルダプレート 27 の中心線 28 上の前記ウェーハ 11 の出入れ側の反対側に 1 個、又、前記中心線 28 に対して左右対称位置に 1 個ずつの計 3 個の爪 29 が固着されている。

【0018】 該爪 29 は支柱部 30 と内鏝部 31 で構成

され、該内罎部31は前記支柱部30の側面で該支柱部30の上端より1段低い位置に、前記内罎部31の先端が前記ホルダプレート27の中心方向を指す様、固着されている。

【0019】図11を参照して前記ポート7と前記カセット棚3間での前記ウェーハ11の移載について説明する。

【0020】前記チャッキングヘッド10を後退させ、前記ツイザ12が前記進退機構部9より突出しない状態として該進退機構部9を回転させ、前記チャッキングヘッド10を前記カセット棚3の前記ウェーハカセット23に対峙させる。前記チャッキングヘッド10を前進させ、複数段、図11では5段の前記ツイザ12を前記ウェーハカセット23内に挿入し、移載機エレベータ（図示せず）により前記進退機構部9を若干上昇させ、前記ウェーハ11を前記各ツイザ12上に載置する。該ツイザ12上に前記ウェーハ11を載置した状態で、前記チャッキングヘッド10を後退させ前記ツイザ12が前記進退機構部9より突出しない状態として該進退機構部9を回転させ、前記チャッキングヘッド10を前記ポート7の所要位置に対峙させる。前記チャッキングヘッド10を前進させ前記各ツイザ12を前記ポート7内に挿入し、前記移載機エレベータ（図示せず）により前記進退機構部9を若干下降させ、前記ウェーハ11を前記爪29の前記内罎部31上に載置する。

【0021】前記動作を繰返し、予定された数の前記ホルダプレート27の前記爪29の前記内罎部31上に前記ウェーハ11を載置する。又、処理完了後の前記ポート7から前記カセット棚3への移載は前記手順の逆の手順で行う。

【0022】

【発明が解決しようとする課題】生産性を向上させる為、一度に処理するウェーハの枚数を増大させるという要望があり、斯かる要望に対応する為にはポートに装填されるウェーハの枚数を増大させる必要がある。ところが、半導体製造装置が設置されるスペースには建屋、クリーンルーム等による高さ制限があり、ポートに装填するウェーハの枚数を増大させるにはホルダプレート間のピッチを狭くせざるを得ない。

【0023】上記した従来のポートでは、ポートにツイザを装入する際に必要な間隙、ツイザの撓み等を考慮すると、ホルダプレート間の間隙を狭くするには限界があり、ポートに保持できるウェーハの枚数を増やすことができず、スループットの向上、生産コストの低減化が図れないという問題があった。

【0024】本発明は斯かる実情に鑑み、1回に処理されるウェーハの枚数を増やし、スループットの向上を図ろうとするものである。

【0025】

【課題を解決するための手段】本発明は、複数の支柱に

ホルダプレートを水平姿勢で多段に固着し、該ホルダプレート上面にウェーハ受載用の爪を突設すると共にウェーハ移載用ツイザが遊嵌可能な凹部を設けた半導体製造装置のポートに係り、凹部位置にツイザが進入し、凹部によりツイザの上下移動の空間を確保する。

【0026】

【発明の実施の形態】以下、図面を参照しつつ本発明の実施の形態を説明する。尚、図1～図3中、図6～図10と同等のものには同符号を付し説明は省略する。

【0027】ポート36は底板37と天板38間に掛渡って複数本の支柱39が立設された構成を有し、該支柱39はウェーハの出入れが可能な様に略半円周の範囲で配設されている。該支柱39には円環上の石英製ホルダプレート40が水平姿勢で多段に溶接され、該ホルダプレート40の上面には該ホルダプレート40の中心線41上のウェーハの出入れ側の反対側に1個、又、前記中心線41に対して左右対称位置に1個ずつ計3個の爪42が固着されている。該爪42は支柱部43と内罎部44で構成され、該内罎部44は前記支柱部43の側面で該支柱部43の上端より1段低い位置に、前記内罎部44の先端が前記ホルダプレート40の中心方向を指す様、固着されている。

【0028】前記ホルダプレート40の上面で前記中心線41上の前記爪42の両側には、それぞれ第1凹部45が形成され、該各第1凹部45はツイザ12の双股形状の先端部分の幅より広く、且前記ホルダプレート40の円環幅より狭くなっている。又、前記ホルダプレート40の上面でウェーハの出入れ側には第2凹部46が形成され、該第2凹部は前記ツイザ12の基端部分の幅より広く、且前記ホルダプレート40の円環幅全体に渡り設けられ、前記ツイザ12は前記第1凹部45、第2凹部46に遊嵌可能となっている。

【0029】以下作動を説明する。

【0030】カセット棚3のウェーハカセット23から前記ツイザ12上にウェーハ11を受載し、前記ツイザ12をポート7の所要位置に対峙させる。チャッキングヘッド10を前進させ、前記ツイザ12を前記ポート7内に挿入し、移載機エレベータ（図示せず）により進退機構部9を若干下降させ、前記ウェーハ11を前記爪42上に載置し、前記ツイザ12を前記第1凹部45、第2凹部46位置に進入させ、前記ツイザ12を前記ポート7より引出す。前記第1凹部45、第2凹部46の分だけ上下方向の間隔に余裕ができ、前記ツイザ12を前記ポート7より引出す時の前記ツイザ12上面と前記爪42上に載置された前記ウェーハ11下面とのクリアランス及び前記ツイザ12下面と前記ホルダプレート40上面とのクリアランスが拡大し、前記ツイザ12が撓んでも前記ホルダプレート40と接触することはない。

【0031】

【比較例】図12～図14は従来のポートとツイザとの

関係を示しており、前記ホルダプレート 27 の上下間ピッチを 8.5mm と仮定する。前記ツイザ 12 の厚みが 1.85mm、前記ウェーハ 11 の厚みが 0.8mm である為、図 12 に示す様に、前記ツイザ 12 上に前記ウェーハ 11 を載置した状態で前記ツイザ 12 を前記ポート 7 に挿入する時は、前記ウェーハ 11 上面と該ウェーハ 11 の直上の前記ホルダプレート 27 下面及び前記ウェーハ 11 下面と前記内鑿部 31 上面とのクリアランスが共に 1.1mm となり移載作業が可能である。しかし、図 13 に示す様に、前記ツイザ 12 を前記ポート 7 より引出す時は、前記ツイザ 12 上面と前記ウェーハ 11 下面とのクリアランス及び前記ツイザ 12 下面と前記ホルダプレート 27 上面とのクリアランスは共に 0.825mm となり、図 14 に示す様に前記ツイザ 12 の通常の撓み量は 0.35mm であり、機械の作動誤差等を考えるとクリアランスが充分ではない為、前記ウェーハ 11 の移載作業が不可能となる。

【0032】本発明の実施例に於いては、ホルダプレート 40 の上下間ピッチを 8.5mm とし、前記第 1 凹部 45、第 2 凹部 46 の前記ホルダプレート 40 上面からの段差は 0.5mm とする。

【0033】前記ツイザ 12 上に厚さ 0.8mm のウェーハ 11 を載置した状態で前記ツイザ 12 を前記ポート 36 に装入する時は、図 12 に示す従来の場合と同様に、前記ウェーハ 11 上面と該ウェーハ 11 直上の前記ホルダプレート 40 下面及び前記ウェーハ 11 下面と前記内鑿部 44 上面とのクリアランスが共に 1.1mm となり、又、前記ツイザ 12 を前記ポート 36 より引出す時は、前記ツイザ 12 上面と前記ウェーハ 11 下面とのクリアランス及び前記ツイザ 12 下面と前記ホルダプレート 40 上面とのクリアランスは共に、図 13 で示す従来の場合より 0.25mm ずつ大きくとれる為、1.075mm となり前記ウェーハ 11 の移載作業が可能となる。

【0034】従って、1 回に生産する製品用のウェーハの枚数を 75 枚から 100 枚に増やすことができ、スループットの向上が図れ、又、生産コストの低減化が可能

となる等、種々の優れた効果を発揮する。

【0035】

【発明の効果】以上述べた如く本発明によれば、ホルダプレート間のピッチを縮め、ポートに保持できるウェーハの枚数を増やすことができる為、スループットの向上が図れ、又、生産コストの低減化が可能となる等、種々の優れた効果を発揮する。

【図面の簡単な説明】

【図 1】本発明の実施の形態を示す立面図である。

【図 2】該実施の形態に於けるホルダプレートの斜視図である。

【図 3】該実施の形態に於けるホルダプレートの平面図である。

【図 4】半導体製造装置の説明図である。

【図 5】ポートを具備した縦型炉の断面図である。

【図 6】従来のポートにホルダプレートを取付けた状態の平面図である。

【図 7】従来のホルダプレートの側面図である。

【図 8】図 7 の A 矢視部分拡大図である。

【図 9】従来のポートの斜視図である。

【図 10】従来のポートの立面図である。

【図 11】ポートとカセット棚間でのウェーハの移載についての説明図である。

【図 12】従来のポートにツイザを挿入した時の側面図である。

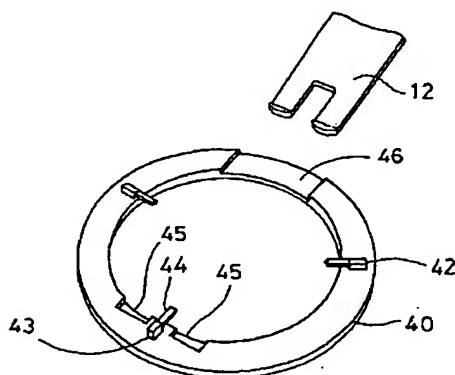
【図 13】従来のポートからツイザを引出した時の側面図である。

【図 14】従来のツイザにウェーハを載置した時の撓み量を示す説明図である。

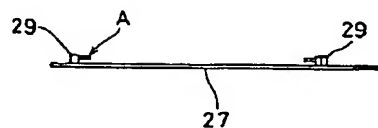
【符号の説明】

36	ポート
39	支柱
40	ホルダプレート
42	爪
45	第 1 凹部
46	第 2 凹部

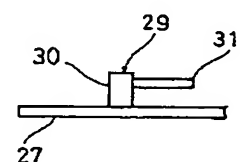
【図 2】



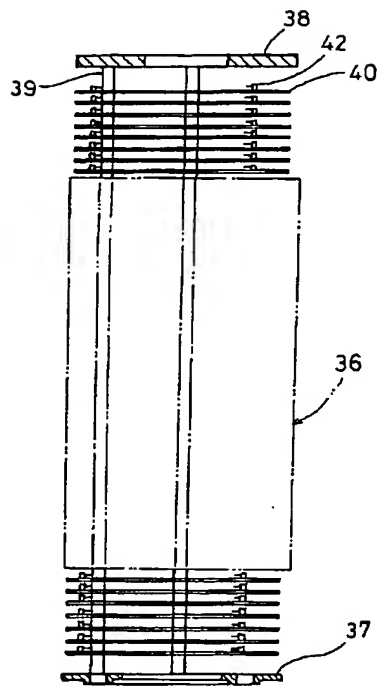
【図 7】



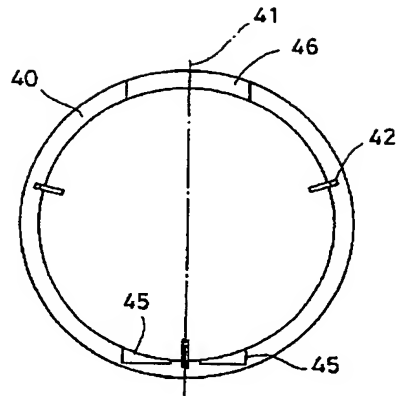
【図 8】



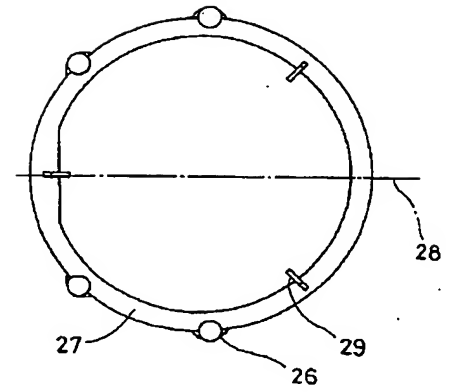
【図 1】



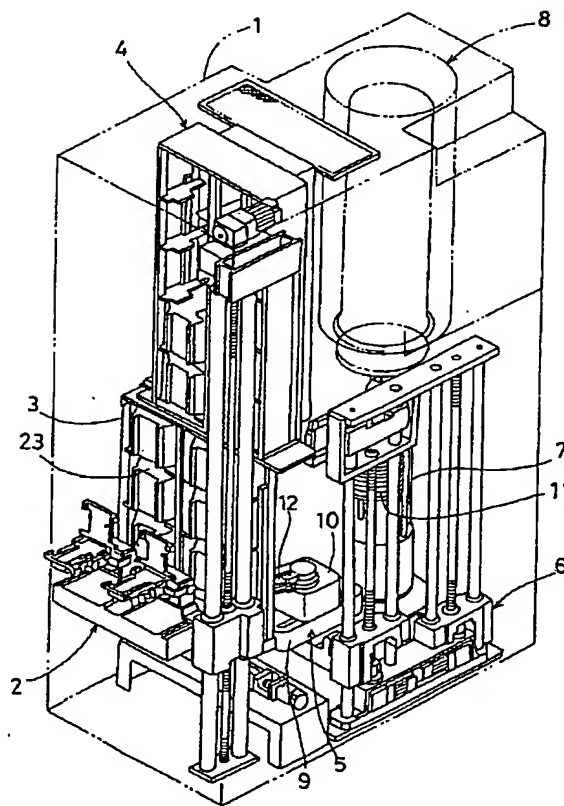
【図 3】



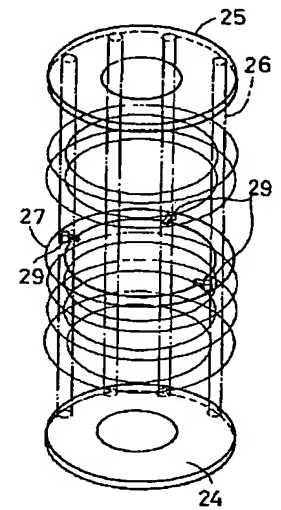
【図 6】



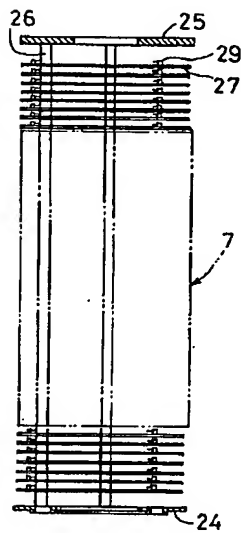
【図 4】



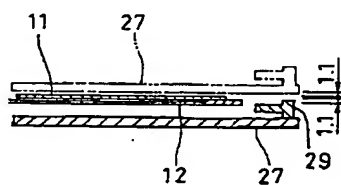
【図 9】



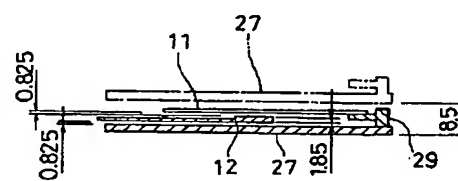
【図 10】



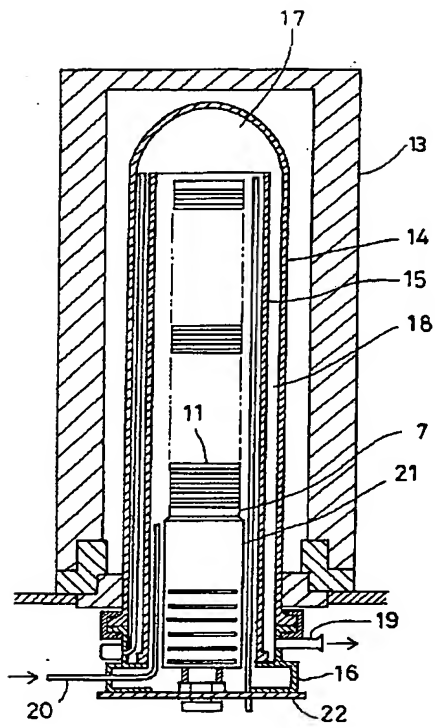
【図 12】



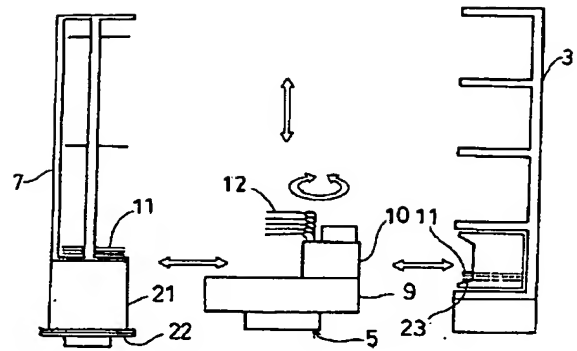
【図 13】



【図 5】



【図 11】



【図 14】

